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CRITICAL AND STRATEGIC METALS PROGRAM

Field Report: Welchina Area, South Fork of the Matanuska River

Anchorage Quadrangle

by William S. Roberts

NELCHINA FIELD REPORT

Critical and Strategic Minerals

INTRODUCTION

This report represents a small portion of the Bureau's Alaskan Critical and Strategic Metals Program initiated FY81. During the initial phase of the program an effort was made to define targets that had a decided potential for chrome, platinum group metals (PGM), and cobalt. Accordingly the Nelchina area was selected for a reconniassance field investigation on the following basis:

1. Published geologic information indicates potentially favorable hosts for the commodities cited above.
2. Ultramafic/mafic rocks occurring within a regionally recognized structural trend have recognized chromite occurrences and minor PGM.
3. Placer platinum is reportedly to have been produced in minor quantities from creeks within 15 miles of the area of interest. This suggests a minor potential for PGM exists within genetically favorable rocks located in the Nelchina area.
4. The lack of placer PGM occurrences immediately within the study area does not necessarily detract from the potential for lode deposits because heavy glaciation would have obliterated or masked precious metal placer deposits.
5. The present low funding level of the Critical and Strategic Metals program dictated areas with easy access be evaluated during the initial phase of the program.

Objectives of Field Investigation

The investigative approach used in the reconnaissance field evaluation of the Nelchina area included:

1. Examination of the field relationships and rock types potentially hosting PGM, chromite, and/or cobalt mineralization.
2. Collecting lithogeochemical samples of potential host rocks.
3. Collecting, from first and second order drainages, stream sediment and pan concentrate samples for geochemical analysis.
4. Defining the mineralogy of anomalous geochemical samples.

If analytical results suggested any strong anomalies, future detailed field and laboratory examinations would be planned during a later phase in the C&SM Program.

Location, Accessibility, and Land Status

The area of investigation lies within the west half of T 19 N, R 11 E, Seward Meridian (see figures 1 and 2). Sampling was restricted to an area bounded on the east by the South Fork of the Matanuska River, on the south by the terminus of an alpine glacier, on the north by the Matanuska River valley, and on the west by the rugged, relatively unstable mountains that form the western margin of the river valley .

The nearest roadhouse, Sheep Mountain Lodge, lies approximately 5 miles to the NW of the study area. Palmer, the nearest community, lies 58 miles to the west-southwest.

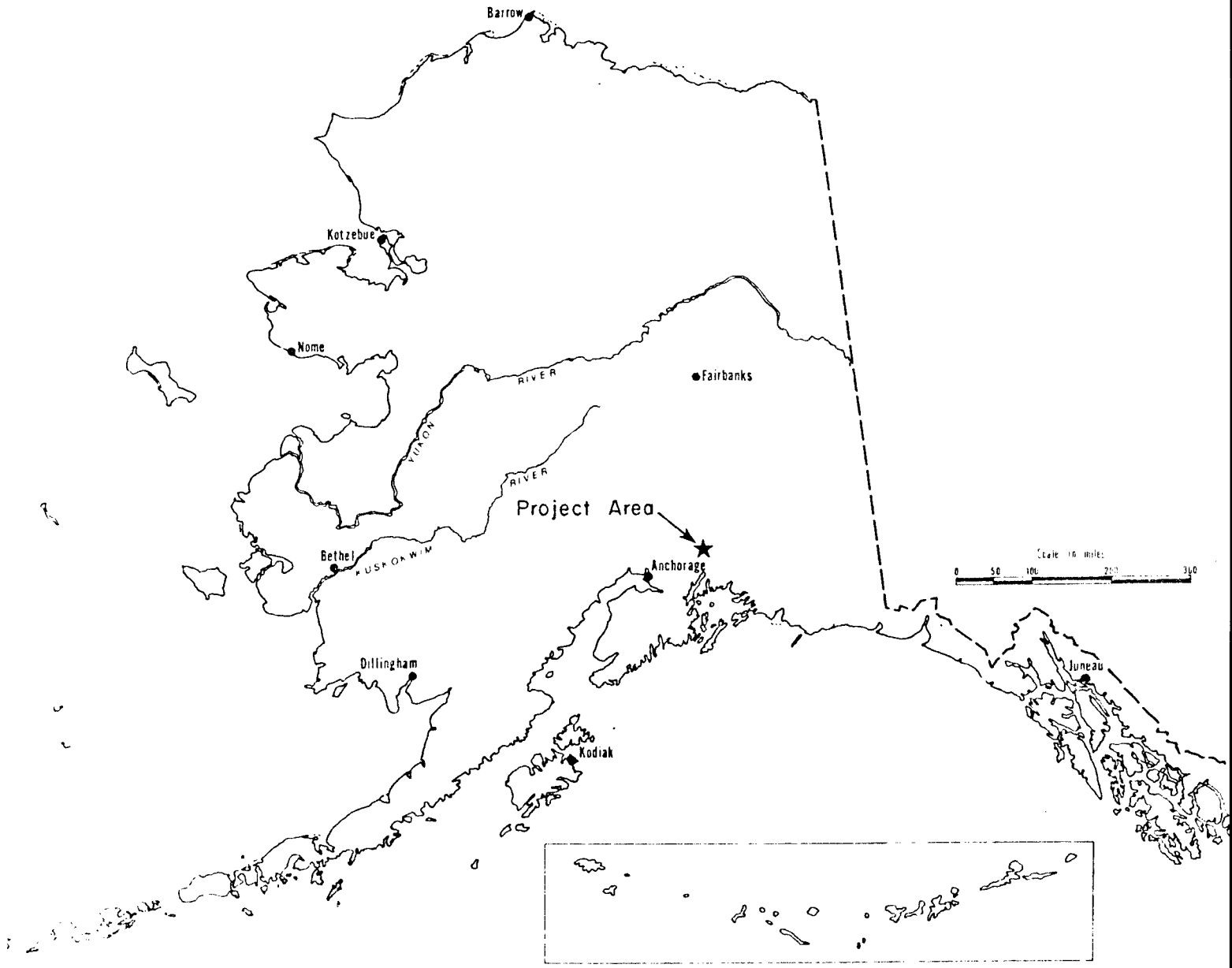

Figure 1. General location map of study area.

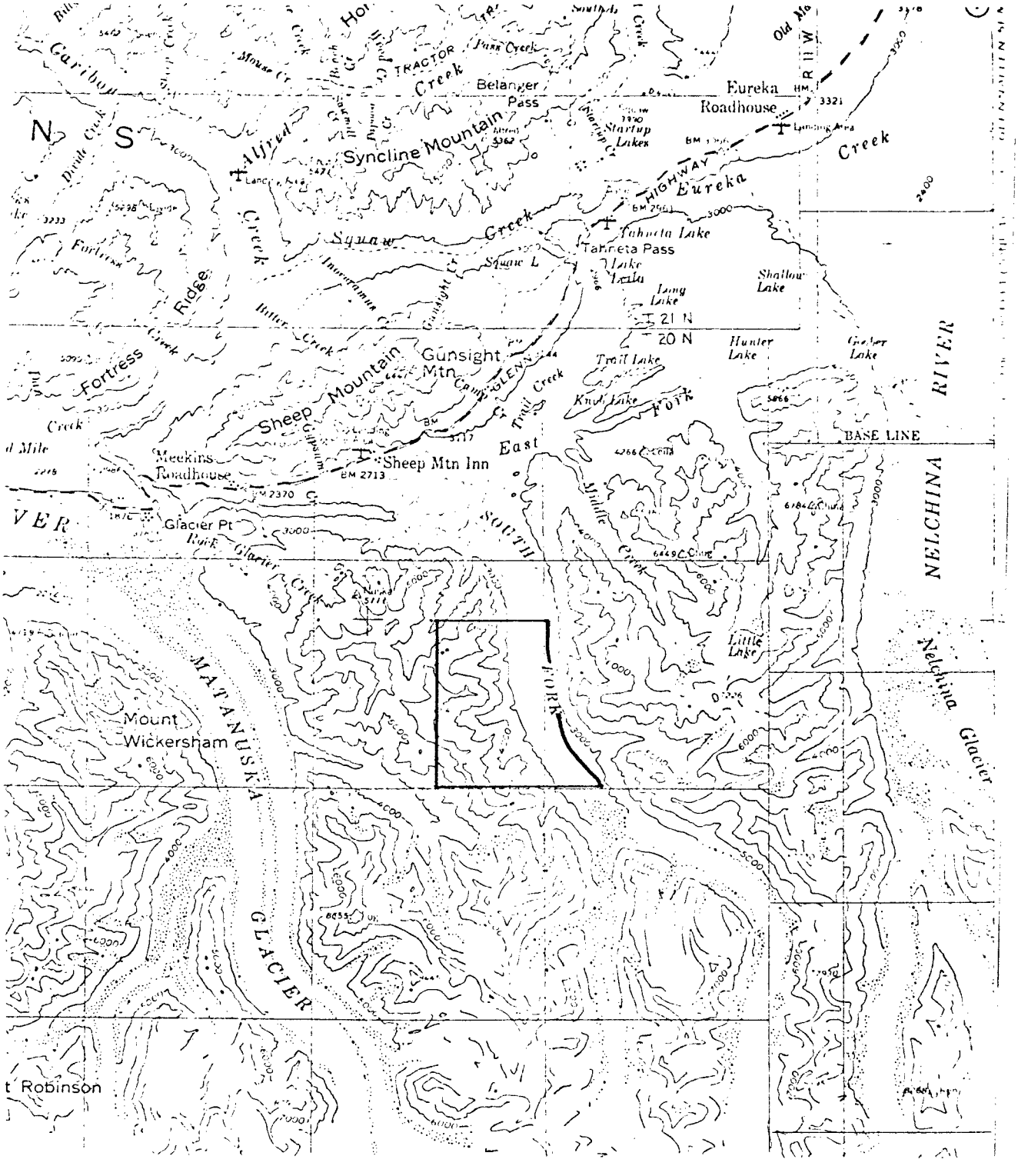

Figure 2. General Reference Map of Study Area.
Anchorage 1:250,000 Quadrangle

Accessibility

Access to the study area requires overland walking, by horseback, by helicopter or by fixed-wing aircraft with short field capabilities. Road access to Sheep Mountain Lodge via the Glenn highway is the closest point accessible by automobile. From Sheep Mountain Lodge it is possible to walk into the area along a trail that is used by big-game guides and hunters. However, crossing the Matanuska River by foot is generally not possible - big game guides use horses and even with local knowledge they have to use caution when crossing because of shifting river channels and highly variable flow conditions. Local guides with horses are available for contracting. Near the terminus of the glacier at the head of the South Fork Matanuska River valley a small big-game guiding camp with airstrip can be found. Access utilizing the airstrip should be restricted to "bush" in services. Permission from the camp operators should be obtained prior to usage.

Land Status

According to the Bureau of Land Management the study area has been selected by the State of Alaska. At present a temporary approval has been given by the U.S. Government so it is presently being administered by the Sate of Alaska. Formal patent will be granted after surveying is completed (1)[1/].

Physiography

According to Wahrhaftig (16) the study area lies within the Kenai-Chugach Mountains Section of the Border Ranges Province. The area is characterized by extremely rugged, heavily glaciated ridges and valleys. Much of the rock on the steep slopes are unstable: this is probably due to youthful, emergent tectonics.

1/. Underlined items in parentheses refer to items in the bibliography section.

Time on Project and Logistics

The writer and two graduate student geologists, Dennis Southworth and Don Coleman, spent a total of three days sampling the area to the west of the South Fork of the Matanuska River. A tent camp was located in Sec 30, T 19 N, R 11 E , on the west bank of the South Fork of the Matanuska River. The crew was flown in August 19 (A.M.), and returned to the staging area at Sheep Mountain Lodge early on August 22. A trail leads approximately from from the Glen Highway at a point about 0.5 miles east of Sheep Mountain Lodge, crosses the East Fork and South Fork, and runs up the South Fork on the west bank at least as far as the glacier's terminus. Mark Meekin, a registered guide, offered his services as cook, out-fitter, and a supplier of horses for any future work. Sheep hunting is conducted in the area beginning August 15. Any scheduled work should be planned before this date.

A tent camp located in this area could be supplied either by horses (e.g. Mark Meekin) or by helicopter. Most camping will have to be done down fairly low along the river bottoms because of vegetation and steep glaciated topography.

Helicopter landing sites are generally confined to either valley bottoms or ridges. Numerous landing sites were noted, however a lot of the map area is very steep and would be accessible only by foot. Much of the map area (estimated 50%) is very rugged and will require carefully planned traverses.

PREVIOUS WORK

A geologic mapping effort (at 1:63,360 scale) of the Chugach Mts. in the Anchorage quadrangle is currently underway by the DGGS, Dept. of Natural Resources, State of Alaska. Principal investigators include G.H. Pessel, M. W. Henning, and L.E. Burns. As I understand it L.E. Burns is currently doing a Ph.D. study of the gabbroic rocks in the Nelchina area. DGGS published information inlude Open File Reports 121 (14) and 126 (9).

General Geology

For the geology of the area it is recommended to read the above cited open file reports. The area is complexly folded, faulted and metamorphosed. Crudely layered gabbroic rocks have been mapped, but their genesis is still being worked out.

The area traversed to the west of the South Fork of the Matanuska consists primarily of igneous/meta-igneous rocks. Much of the gabbro varies from melanogabbro to leucogabbro. Anorthositic banding, generally poorly defined, can often be traced within the gabbro. Other igneous rocks are present within the area, but they are generally difficult to differentiate because of the metamorphosis and tectonic shearing and mixing of rock types. Occasionally felsic volcanic float was found, but none was located in place.

SAMPLING AND RESULTS

A total of 46 samples were collected during the reconiassance field investigation. Grab rock sample locations are plotted on Figure 3 , while the stream sediment, pan concentrate, and soil samples are plotted on Figure 4. The analytical results are listed in Table 1.

The fire assay/ICAP data was done by C.W. Merrill (pre-concentration) and W. Barry (ICAP) of the Bureau of Mines. The atomic absorption data was generated by TSL Laboratories of Spokane, Washington.

Only three samples warrant comment. Pan concentrate CM19855p was analyzed to contain 0.064 oz/ton Au. Pan concentrate CM19912p had detectable palladium with a reported value of 0.012 oz/ton in the concentrate. The weights of the pan concentrates were 15.39 and 7.6 grams respectively. Both concentrate samples were panned from a standard 16 inch gold pan representing concentrates from 0.5 cubic feet of alluvium. Assuming the 0.5 cubic foot samples weighed 50 pounds each, the estimated concentration of Au in sample CM19855 and Pd in CM19912 would be less than 2 PPB. These are admittedly low concentrations. It is unclear as to the significance of these values, but, detecting the presence of palladium in a pan concentrate from a non-ultramafic terrane must be considered anomalous. In contrast to gold, palladium is known to occur as sulfides/arsenides and generally would not be expected to survive as well as gold in an oxidizing, high energy environment. Detecting palladium, even at low concentrations, is an anomaly in itself. Determining the mineralogy of the palladium-bearing mineral is not possible without resampling because the entire sample was consumed in the analytical process.

A massive sulfide sample (CM 19807) was located on a steep slope at about 4400 feet elevation. The sample was angular and had apparently not traveled too far. Oxidation effects were present but most of the sample was relatively fresh. The sample consisted of massive pyrite, pyrrhotite, and chalcopyrite and was analyzed to contain 1100 ppm Co, 6000 ppm Ni, and over 13,000 ppm Cu. An inspection upslope from the sample site revealed no similar sulfide concentrations but altered, sheared gabbro was present nearby.

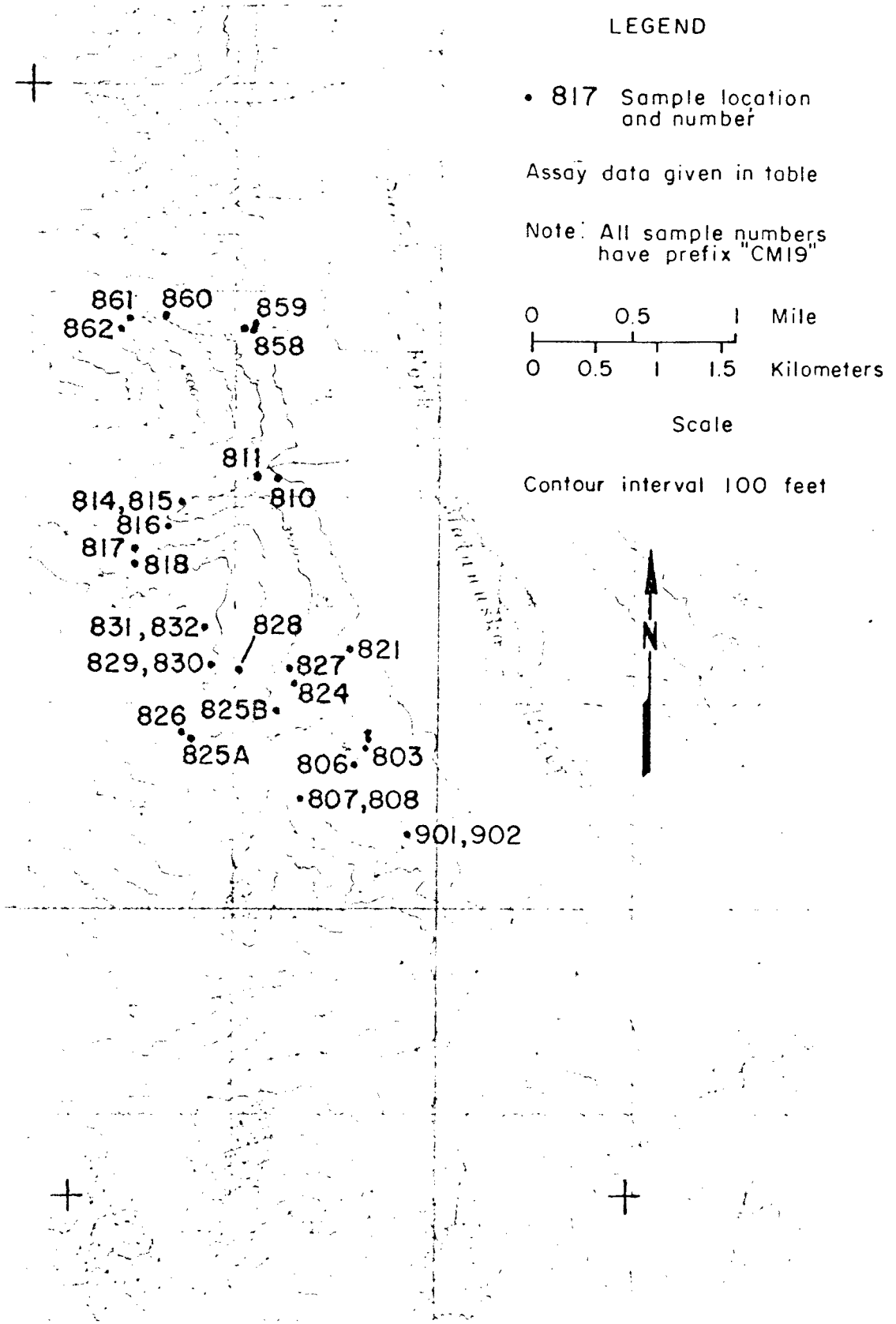

Figure 3. Location map of rock samples.

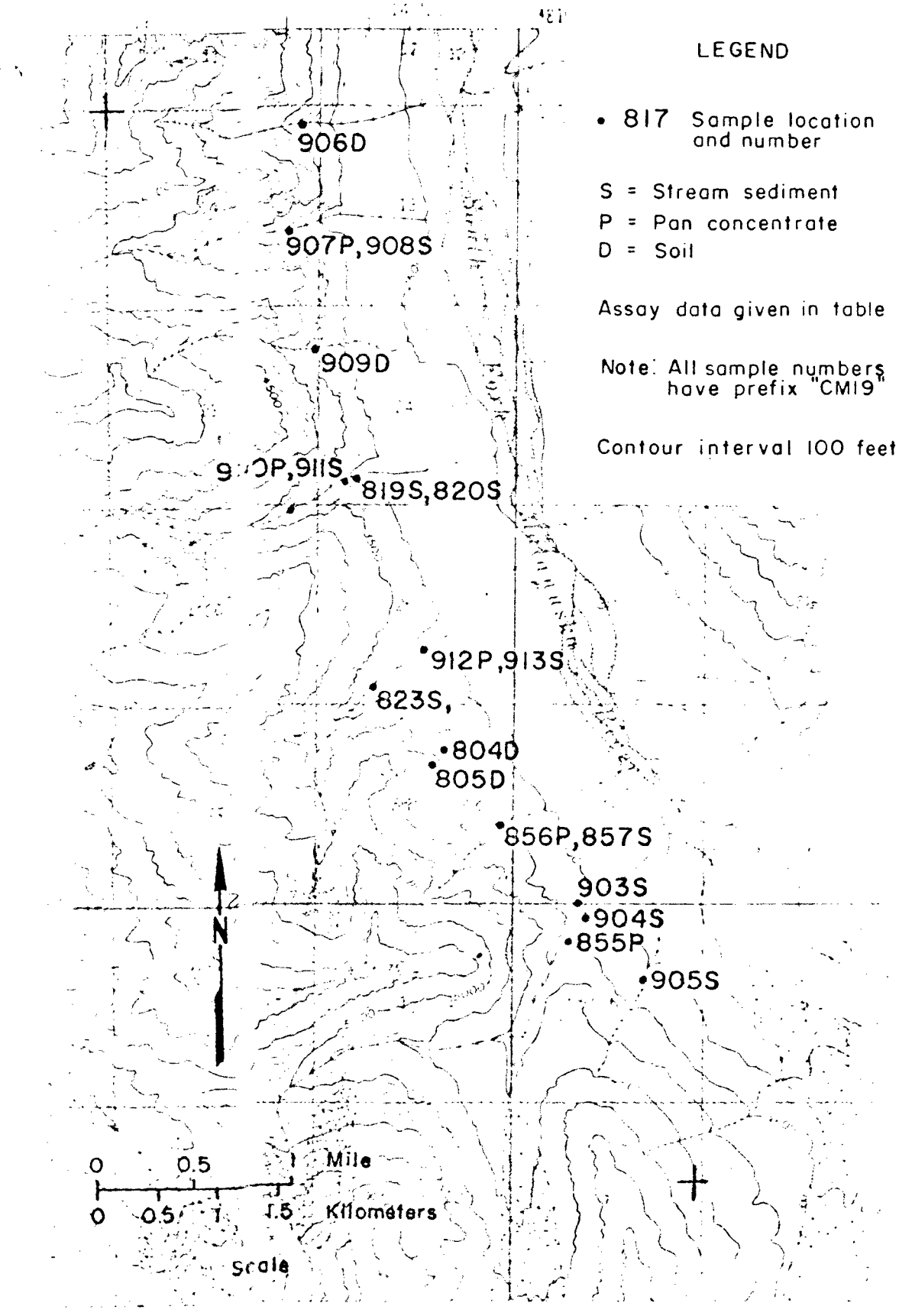

Figure 4. Location map of stream sediment, soil, and pan concentrate samples.

Field Sample No.	Map No. [1]	Sample Type	OZ/TON [2]			PARTS PER MILLION [3]								COMMENTS
			Au	Pt	Pd	Ag	Cu	Ni	Co	Pb	Zn	Hg	Cr	
CM19804 D		Soil	—	—	—	1.6	18	240	125	62	24	<0.1	690	Derived from composite
CM19805 D		do.	—	—	—	0.1	83	26	34	42	14	<0.1	230	Hematitic soil
CM19819 S		STREAM SEDIMENT	—	—	—	0.2	72	24	27	54	12	<0.1	145	
CM19820 S		do.	—	—	—	0.3	65	22	24	51	10	<0.1	180	
CM19823 S		do.	—	—	—	1.4	48	69	42	48	16	<0.1	275	
CM19855 P		PAN CONCENTRATE	0.064	<0.002	<0.002	—	—	—	—	—	—	—	—	15.39 g, 1 screened pan
CM19856 P		do	<0.0006	<0.003	<0.003	—	—	—	—	—	—	—	—	
CM19857 S		STREAM SEDIMENT	—	—	—	0.5	60	32	33	65	13	<0.1	200	
CM19903 S		do.	—	—	—	0.4	92	21	27	63	11	0.4	76	
CM19904 S		do.	—	—	—	0.6	45	44	21	82	19	<0.1	85	
CM19905 S		do.	—	—	—	0.6	65	73	28	142	22	0.1	265	
CM19906 D		Soil	—	—	—	0.3	45	12	17	58	9	<0.1	58	
CM19907 P		PAN CONCENTRATE	<0.0004	<0.002	<0.002	—	—	—	—	—	—	—	—	13.80 g, 1 screened pan
CM19908 S		STREAM SEDIMENT	—	—	—	0.9	54	26	23	57	11	<0.1	85	
CM19909 D		Soil	—	—	—	0.4	91	21	25	61	9	<0.1	88	Ground covered, sediment allowed
CM19910 P		PAN CONCENTRATE	<0.0006	<0.003	<0.003	—	—	—	—	—	—	—	—	9.88 g, 1 screened pan
CM19911 S		STREAM SEDIMENT	—	—	—	0.9	76	29	30	62	19	<0.1	140	
CM19912 P		PAN CONCENTRATE	<0.0008	<0.004	0.012	—	—	—	—	—	—	—	—	7.6 g, 1 screened pan
CM19913 S		STREAM SEDIMENT	—	—	—	0.2	57	57	36	66	14	<0.1	255	

1 screened pan = screened material (< 1/4") in ~16" Pan ≈ 0.5 Ft.^{3}

Table 1. Analytical results..
FA/ICAP data by C.W. Merrill and W. Barry, U.S.B.M.
Atomic absorption data by TSL Laboratories, spokane Washington.
--- = not requested

Field Sample No.	Map No. [1]	Sample Type	OZ/TON [2] Au	Pt	Pd	PARTS PER MILLION [3] Ag	Cu	Ni	Co	Pb	Zn	Hg	Cr	COMMENTS
CM19803 R		Rock	—	<0.001	<0.001	0.4	4	335	135	29	74	<0.1	—	Bk. Serpentinite
CM19806 R		"	—	—	—	—	—	—	—	—	—	—	—	Lt. purple metavolcanite
CM19807 R		"	<0.0002	<0.001	<0.002*	3.5	13100	6000	1100	18	140	0.9	—	Massive sulfides, Py, Po, Cpy
CM19808 R		"	—	<0.001	<0.001	0.1	70	14	26	13	53	0.2	—	Bk. F. gr. serpentinite
CM19810 R		"	—	<0.001	<0.001	0.7	145	9	21	7	64	<0.1	—	Fe stained F. gr. diabase
CM19811 R		"	—	<0.001	<0.001	0.5	260	27	29	11	46	<0.1	—	Gabbroic rock with Fe + Cu stain
CM19814 R		"	—	—	—	—	—	—	—	—	—	—	—	Altered, layered gabbro
CM19815 R		"	—	<0.001	<0.001	0.6	295	15	48	9	54	<0.1	—	Limonitic zone, py + po stained
CM19816 R		"	—	<0.001	<0.001	0.3	72	8	19	11	58	0.1	—	Limonitic "pod"
CM19817 R		"	—	<0.001	<0.001	0.3	155	16	29	11	74	<0.1	—	Sheared, hematitic F. grained rock
CM19818 R		"	—	—	—	—	—	—	—	—	—	—	—	Leuco-gabbro
CM19820 R		"	—	—	—	—	—	—	—	—	—	—	—	
CM19824 R		"	—	—	—	—	—	—	—	—	—	—	—	C. grained serp. from Fe(?)
CM19825A R		"	—	<0.001	<0.001	0.1	1050	33	41	10	45	<0.1	—	
CM19825B R		"	<0.0002	<0.001	<0.001	1.2	4	305	99	23	53	<0.1	—	Limonite zone, contact @ gabbro
CM19826 R		"	<0.0002	<0.001	<0.001	0.1	280	39	45	13	79	0.1	—	Limonite zone, Py + Po(?)
CM19827 R		"	—	—	—	0.5	3	378	115	20	42	0.1	—	Orange lam. serp. bearing serp.
CM19828 R		"	<0.0002	<0.001	<0.001	0.3	8	438	130	25	63	<0.1	—	Bk. to dk. gr. serp.
CM19829 R		"	—	—	—	—	—	—	—	—	—	—	—	Serp. leuco gabbro
CM19830 R		"	—	—	—	0.1	500	74	33	23	34	0.2	—	Fe stained carbonate(?)
CM19831 R		"	—	<0.001	<0.001	<0.1	24	405	130	22	68	<0.1	—	

Table 1. (Con't)

Field Sample No.	Map No. [1]	Sample Type	OZ/TON [2]			PARTS PER MILLION [3]							COMMENTS
			Au	Pt	Pd	Ag	Cu	Ni	Co	Pb	Zn	Hg	Cr	
CM19832		Specimen	—	—	—	—	—	—	—	—	—	—	—	Molybdenite deposit host rock
CM19858 R			—	<0.001	<0.001	<0.1	24	9	20	12	84	<0.1	—	
CM19859 R			—	<0.001	<0.001	<0.1	20	9	24	11	66	<0.1	—	Foliated (?) gabbro
CM19860 R			—	—	—	—	—	—	—	—	—	—	—	F to M gr. leucocratic dike
CM19861 R			—	—	—	<0.1	47	8	20	11	74	<0.1	—	Serpentinized, sheared
CM19862 R			—	—	—	—	—	—	—	—	—	—	—	Fe stained gabbro

Table 1. (Con't)

In a NE-SW drainage in section 26, T19N, R11E, several limonitic "pods" were sampled (CM 19815 and CM 19816). These pods ranged in size from several feet long and a few inches thick to approximately 100 to 125 feet high by 15 to 50 feet wide. Oxidation of the pods was indicated by the bright yellow and red-brown colors and presence of boxworks. The only sulfide identified in hand specimen was pyrite. Analyses of relatively fresh samples from the limonitic zones indicate no anomalous values of Cu, Ni, or Co.

The limonitic zones appeared to be located at the contact between a leucogabbro and melanogabbro.

The serpentinites inspected are thin, highly altered and black to very dark green in color. They appear to be present along the margins of contrasting rock units and probably represent a tectonic contact of highly altered mafic igneous rocks. No relict textures were discernible in hand specimens, although gabbro was located nearby.

Present in minor amounts is an orange-brown weathering carbonate-bearing serpentinite, probably representing metamorphosed ultramafics. The serpentinites have elevated Ni and Cr values, as expected. These rocks are spatially associated with the dark green serpentinites and suggest low grade metamorphism (after Winkler, 17).

CONCLUSIONS

The following conclusions are based on a short reconnaissance investigation of an area near the South Fork of the Matanuska River.

1. The area is geologically complex. A large variety of rock types are noted along with very complex tectonics. These factors make an economic evaluation for the area difficult.

2. Significant exposures of a crudely layered gabbro are present in the area investigated. Sulfides are present in accessory amounts, and in sheared, limonitic "pods" up to 100 to 125 feet high by 15 to 50 feet thick. Grab sample analyses from the pods indicate no significant concentrations of Cu, Ni, or Co. Pyrite was identified in hand specimen.

3. Ultramafic rocks in the area investigated appear to be present in minor amounts.

4. A float sample consisting of massive sulfides contains significant concentrations of Cu, Ni, and Co. The source for the sulfide sample was not located.

5. Palladium was detected in a pan concentrate. The mineralogy or source for the palladium was not determined.

6. The rocks present within the study area (layered gabbros) have a potential of unknown magnitude for PGM. The potential for chrome is considered low since suitable host rocks are present in very limited amounts and they are significantly altered physically and chemically. The potential for Co is undefined, but one sample suggests the area should be considered in any future investigations pertaining to cobalt.

Recommendations

An economic evaluation for the potential of the South Fork of the Matanuska River area will require a carefully planned investigation keyed to the complex geology. Sampling favorable hosts will be dependent on accurate control of the geology and structure of the area.

The presence of a layered gabbroic complex suggests that a potential, of unknown magnitude, exists for the presence of platinum group elements. Efforts to define this potential are recommended only if adequate time and funding permit sampling and mapping at sufficient detail to understand the distribution and chemistry of the gabbro and related rocks. The terrain is sufficiently rugged to expect considerable difficulty in evaluating the area in detail.

Similar comments can be made with respect to cobalt. The geology and rugged terrain make this a difficult area to work in. It would be recommended only if adequate time and money were available or other, more accessible targets were absent.

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